



5-25-05

IFW
#

Express Mail Number EV 534 877 294 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Carlos.Dangelo	Confirmation No.:	5164
Serial No.:	10/762,666	Art Unit:	2811
Filed:	January 22, 2004	Examiner:	Parekh, Nitin
For:	<i>Method and Apparatus for the Use of Self-Assembled Nanowires for the Removal of Heat from Integrated Circuits</i>	Attorney Docket No.:	062273-5001-US

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure provisions of 37 C.F.R. §1.56, there is hereby provided certain information which the Examiner may consider material to the examination of the subject U.S. patent application. It is requested that the Examiner make this information of record if it is deemed material to the examination of the application.

1. Enclosures accompanying this Information Disclosure Statement are:

- 1a. ☒ A list of all patents, publications, applications, or other information submitted for consideration by the office.
- 1b. A legible copy of:
- ☐ Each U.S. patent application publication and U.S. and foreign patent;
 - ☒ Each publication or that portion which caused it to be listed on the PTO-1449;
 - ☐ For each cited pending U.S. application, the application specification including the claims, and any drawing of the application, or portion of the application which caused it to be listed on the PTO-1449 including any claims directed to that portion;
 - ☒ all other information or portion which caused it to be listed on the PTO-1449.
- 1c. ☐ An English language copy of search report(s) from a counterpart foreign application or PCT International Search Report.
- 1d. ☐ Explanations of relevancy (ATTACHMENT 1(d), hereto) or English language abstracts of the non-English language publications.

05/26/2005 NNGUYEN1 00000023 500310 10762666

01 FC:1806 180.00 DA

2. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(b):
- ☐ Within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);
 - ☐ Within three months of the date of entry of the national stage as set forth in §1.491 in an international application;
 - ☐ Before the mailing of the first Office action on the merits;
 - ☐ Before the mailing of a first Office action after the filing of a request for continued examination under §1.114.
3. ☒ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(c) after the period specified in 37 C.F.R. §1.97(b), but before the mailing date of any of a final action under 37 C.F.R. §1.113, a notice of allowance under 37 C.F.R. §1.311 or an action that otherwise closes prosecution in the application.

(Check either Item 3a or 3b)

- 3a. ☐ The Certification Statement in Item 5 below is applicable. Accordingly, no fee is required.
- 3b. ☒ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) in accordance with 37 C.F.R. §1.97(c) is:
- ☐ enclosed
 - ☒ to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 062273-5001-US).

(Item 3b to be checked if any reference known for more than 3 months)

4. ☐ This Information Disclosure Statement is filed under 37 C.F.R. §1.97(d) after the period specified in 37 C.F.R. §1.97(c), but on or before the date of payment of the issue fee.

(Check either Item 4a or 4b)

- 4a. ☐ The Certification Statement in Item 5 below is applicable.
- 4b. ☐ The \$180.00 fee set forth in 37 C.F.R. §1.17(p) is:
- ☐ enclosed.
 - ☐ to be charged to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no.).

5. ☐ Certification Statement (applicable if Item 3a or Item 4a is checked)

(Check either Item 5a, 5b or 5c)

- 5a. ☐ In accordance with 37 C.F.R. §1.97(e)(1), it is certified that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.
- 5b. ☐ Each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not received by any individual

designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.

- 5c. ☐ Pursuant to 37 C.F.R. §1.704(d), each item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart application, and the communication was not **received** by any individual designated in 37 C.F.R. §1.56(c) more than thirty days prior to the filing of this information disclosure statement.
6. ☒ Copies of each cited U.S. patent and each U.S. patent application publication are not enclosed pursuant to the USPTO OG Notice dated 05 August 2003 waiving the requirement under 37 C.F.R. 1.98(a)(2)(i) for U.S. patent applications filed after June 30, 2003.
7. ☐ This application is a continuation application under 37 C.F.R. §1.53(b) or (d).

(Check appropriate Items 7a, 7b and/or 7c)

- 7a. ☐ A Petition to Withdraw from issue under 37 C.F.R. §1.313(b)(5) is concurrently filed herewith.
- 7b. ☐ Copies of publications listed on Form PTO-1449 from prior application Serial No. *, filed on *, of which this application claims priority under 35 U.S.C. §120, are not being submitted pursuant to 37 C.F.R. §1.98(d).
- 7c. ☐ Copies of the publications listed on Form PTO-1449 were not previously cited in prior application Serial No. , filed on , and are provided herewith.
8. ☐ This is a Supplemental Information Disclosure Statement. (Check Item 8a)
- 8a. ☐ This Supplemental Information Disclosure Statement under 37 C.F.R. §1.97(f) supplements the Information Disclosure Statement filed on . A bona fide attempt was made to comply with 37 C.F.R. §1.98, but inadvertent omissions were made. These omissions have been corrected herein. Accordingly, additional time is requested so that this Supplemental Information Disclosure Statement can be considered as if properly filed on .
9. ☐ In accordance with 37 C.F.R. §1.98, a concise explanation of what is presently understood to be the relevance of each non-English language publication is:

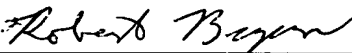
(Check Item 9a, 9b, or 9c)

- 9a. ☐ satisfied because all non-English language publications were cited on the enclosed English language copy of the PCT International Search Report or the search report from a counterpart foreign application indicating the degree of relevance found by the foreign office.
- 9b. ☐ set forth in the application.
- 9c. ☐ enclosed as an attachment hereto.

10. ☒ The Commissioner is authorized to charge any additional fee required or credit any overpayment for this Information Disclosure Statement and/or Petition to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (order no. 062273-5001-US).
11. ☒ No admission is made that the information cited in this Statement is, or is considered to be, material to patentability nor a representation that a search has been made (other than a search report of a foreign counterpart application or PCT International Search Report if submitted herewith). 37 C.F.R. §§1.97(g) and (h).

Respectfully submitted,

Date: May 23, 2005


Robert B. Beyers 46,552
MORGAN, LEWIS & BOCKIUS LLP (Reg. No.)
2 Palo Alto Square
3000 El Camino Real, Suite 700
Palo Alto, CA 94306
(650) 843-4000



INFORMATION DISCLOSURE CITATION PTO-1449				<i>Complete If Known</i>	
				Application Number	10/762,666
				Filing Date	January 22, 2004
				First Named Inventor	Carlos Dangelo
				Art Unit	2811
				Examiner Name	Parekh, Nitin
Sheet	1	of	3	Attorney Docket Number	062273-5001-US

U.S. PATENT DOCUMENTS							
Examiner Initials	Cite No.	Document Number Number - Kind Code ¹	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Class	Subclass	Filing Date if Appropriate
		6,231,744 B1	05-15-2001	Ying et al.			
		6,359,288 B1	03-19-2002	Ying et al.			
		6,432,740 B1	08-13-2002	Chen			
		2003/0111333A1	06-03-2003	Montgomery, et al.			
		2003/0231471A1	12-18-2003	De Lorenzo et al.			
		2004/0013598A1	01-22-2004	McElrath et al.			
		6,856,016 B2	02-15-2005	Searls et al.			

FOREIGN PATENT DOCUMENTS								
Examiner Initials	Cite No.	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Class	Subclass	Translation	
		Country Code ² - Number ³ - Kind Code ⁴ (if known)					Yes	No
		WO 03/054958A1	07-03-2003	Intel Corporation				
		EP 1329953A1	08-03-2003	Intel Corporation				
		WO 03/072679A1	09-04-2003	Carbon Nanotechnologies, Inc.				
		WO 03/107419A1	12-24-2003	Intel Corporation				

OTHER NON PATENT LITERATURE DOCUMENTS		
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published
		Banerjee, Kaustav, et al., "3-D Heterogeneous ICs: A Technology for the Next Decade and Beyond", <i>5th IEEE Workshop on Signal Propagation on Interconnects</i> , Venice, Italy, May 13-16, 2001.
		Cassell, Alan, "Directed Growth of Free-Standing Single-Walled Carbon Nanotubes", <i>J Am. Chemical Society</i> , 1999, 121, pgs. 7975-7976.
		Chiang, Ting-Yen, "A New Analytical Thermal Model for Multilevel ULSI Interconnects Incorporating Via Effect", Center for Integrated Systems, Stanford University (no date given).
		Chiang, Ting-Yen, et al., "Effect of Via Separation and Low-k Dielectric Materials on the Thermal Characteristics of Cu Interconnects", <i>IEDM 2000</i> (no date).
		Cui, Yi, et al., "Doping and Electrical Transport in Silicon Nanowires", <i>Journal of Physical Chemistry</i> . Vol. 104, No. 22, June 8, 2000, pgs. 5213-5216.

Examiner Signature	1-PA/3544211.1	Date Considered	
--------------------	----------------	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ² Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁵ Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

INFORMATION DISCLOSURE CITATION PTO-1449				Complete If Known	
				Application Number	10/762,666
				Filing Date	January 22, 2004
				First Named Inventor	Carlos Dangelo
				Art Unit	2811
				Examiner Name	Parekh, Nitin
Sheet	2	of	3	Attorney Docket Number	062273-5001-US

	de Pablo, P.J., "A simple, reliable technique for making electrical contact to multiwalled carbon nanotubes", <i>Applied Physics Letters</i> , Vol. 74, No. 2, January 11, 1999, pgs. 323-325.
	Delzeit, Lance, et al., "Growth of carbon nanotubes by thermal and plasma chemical vapour deposition processes and applications in microscopy", <i>Nanotechnology</i> , Vol. 13, May 23, 2002, pgs. 280-284.
	Delzeit, Lance, et al., "Growth of multiwall carbon nanotubes in an inductively coupled plasma reactor", <i>Journal of Applied Physics</i> , Vol. 91, No. 9, May 1, 2002, pgs. 6027-6033.
	Goodson, K.E., et al., "Improved Heat Sinking for Laser-Diode Arrays Using Microchannels in CVD Diamond", <i>IEEE Transactions on Components, Packaging, and Manufacturing Technology</i> , Part B, Advanced Packaging, Vol. 20, Issue 1, February 1997, pgs. 104-109.
	Hone, J., et al., "Thermoelectric Power of Single-Walled Carbon Nanotubes", <i>Physical Review Letters</i> , Vol. 80, No. 5, February 2, 1998, pgs. 1042-1045.
	Huang, Z.P., et al. "Growth of highly oriented carbon nanotubes by plasma-enhanced hot filament chemical vapor deposition", <i>Applied Physics Letters</i> , Vol. 73, No. 26, December 28, 1998, pgs. 3845-3847.
	<i>International Semiconductor Road Map (ITRS-2001)</i> , Section on Interconnect, http://public/itrs.net/files/2001ITRS/interconnect.pdf .
	Kong, Jing, et al., "Synthesis of individual single-walled carbon nanotubes on patterned silicon wafers", <i>Nature</i> , Vol. 395, Oct. 29, 1998, pgs. 878-881.
	Kurabayashi, K, et al., "Precision Measurement and Mapping of Die-Attach Thermal Resistance", <i>IEEE Transactions on Components, Packaging, and Manufacturing Technology</i> , Part A: Advanced Packaging, Vol. 21, Issue 3, September 1998, pgs. 506-514
	Li, Jun, et al., "Electronic properties of multiwalled carbon nanotubes in an embedded vertical array", <i>Applied Physics Letters</i> , Vol. 81, No. 5, July 29, 2002, pgs. 910-912.
	Liu, Jie, et al., "Controlled deposition of individual single-walled carbon nanotubes on chemically functionalized templates", <i>Chemical Physics Letters</i> , 303, April 2, 1999, pgs. 125-129.
	McEuen, Paul L., et al., "Single-Walled Carbon Nanotube Electronics", <i>IEEE Transactions on Nanotechnology</i> , Vol. 1, No. 1, March 2002, pgs. 78-85.
	Ren, Z.F., et al., "Synthesis of Large Arrays of Well-Aligned Carbon Nanotubes on Glass", <i>Science</i> , Vol. 282, November 6, 1998, pgs. 1105-1107.
	Shi, Li., "A Microdevice for Measuring Thermophysical Properties of Nanowires and Nanotubes", <i>2001 ASME International Mechanical Engineering Congress and Exposition</i> , November 11-16, 2001, pgs. 359-362.
	Shi, Li., "Scanning thermal microscopy of carbon nanotubes using batch-fabricated probes", <i>Applied Physics Letters</i> Vol. 77, No. 26, December 25, 2000, pgs. 4295-4297.
	Stevens, R., "Improved fabrication approach for carbon nanotube probe devices", <i>Applied Physics Letters</i> , Vol. 77, No. 21, November 20, 2000, pgs. 3453-3455.

Examiner Signature	1-PA/3544211.1	Date Considered	
---------------------------	----------------	------------------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ² Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁵ Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

INFORMATION DISCLOSURE CITATION PTO-1449				Complete If Known	
				Application Number	10/762,666
				Filing Date	January 22, 2004
				First Named Inventor	Carlos Dangelo
				Art Unit	2811
				Examiner Name	Parekh, Nitin
Sheet	3	of	3	Attorney Docket Number	062273-5001-US

		Sun, X, et al., "Theoretical modeling of thermoelectricity in Bi nanowires", <i>Applied Physics Letters</i> , Vol. 74, No. 26, June 28, 1999, pgs. 4005-4007.
		Yakobson, Boris I., et al., "Fullerene Nanotubes: C _{1,000,000} and Beyond", <i>American Scientist online</i> , http://www.americanscientist.org/template/AssetDetail/assetid/2870?fulltext=true&print=yes .
		Zhang, Yuegang, et al., "Electric-field-directed growth of aligned single-walled carbon nanotubes", <i>Applied Physics Letters</i> . Vol. 79, No. 19, November 5, 2001, pgs. 3155-3157.
		Zhang, Wei De, et al., "Synthesis of vertically aligned carbon nanotubes films on silicon wafers by pyrolysis of ethylenediamine", <i>Elsevier, Thin Solid Films</i> , 422, 2002, pgs. 120-125.
		Zhou, P., et al., "Thermomechanical Diagnostics of FLIP-CHIP/BGA Structures Using Phase-Shifting Electronic Speckle Pattern Interferometry", <i>EEP, Advances in Electronic Packaging</i> , Vol. 26-2, ASME, 1999, pgs. 1875-1880.

Examiner Signature	1-PA/3544211.1	Date Considered	
---------------------------	----------------	------------------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ² Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁵ Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.